Patent claims

1. A method for recording microstructural changes in a component (1),
in particular a layer system (1),
by measuring at least one material parameter of the component (1) at least twice and in particular more than twice,
using a measurement method to determine a material parameter selected from the group consisting of electrical capacitance, thermal conductivity, specific heat capacity, peltier coefficient, magnetic susceptibility, ferroelectricity, pyroelectricity, ultrasound or mechanical indenter test.

2. The method as claimed in claim 1,
characterized in that

the first measurement of the at least one material parameter is carried out on a newly produced component (1).

3. The method as claimed in claim 1 or 2,
characterized in that

the first measurement is carried out before the first operational use of the component.

4. The method as claimed in claim 1, 2 or 3,
characterized in that

the at least second measurement takes place at a time interval after the first measurement, after or during initial operational use.

5. The method as claimed in claim 1, 2, 3 or 4,
characterized in that

the method includes a nondestructive measurement method.

6. The method as claimed in claim 1, characterized in that

the method is carried out using a layer system (1) which comprises a substrate (4) and at least one layer (7, 10).

7. The method as claimed in claim 1 or 6, characterized in that

the method is carried out using a layer system (1) which comprises a substrate (4), at least one first layer (7) and an outer layer (10).

8. The method as claimed in claim 6 to 7, characterized in that

the method is used to examine microstructural changes in the substrate (4) and/or the layer (7, 10) of the component (1), which are caused by changes of precipitations in the material of the substrate (4) and/or the at least one layer (7, 10).

9. The method as claimed in one or more of claims 6 to 8, characterized in that

the method is used to examine microstructural changes in the substrate (4) and/or the layer (7, 10) of the component (1), which are caused by cracks in the substrate (4) and/or the at least one layer (7, 10).

10. The method as claimed in one or more of claims 6 to 9, characterized

in that the substrate (4) and/or the layer (7, 10) is an alloy, and
in that the method is used to examine microstructural changes in the substrate (4) and/or the layer (7, 10), which are caused by depletion of at least one alloying element.

11. The method as claimed in one or more of claims 6 to 10, characterized in that

the method is used to examine microstructural changes in the substrate (4) and/or the at least one layer (7, 10), in particular a porous ceramic layer (10), which are caused by sintering-up of the porous substrate (4) and/or the layer (7, 10).

12. The method as claimed in one or more of claims 6 to 11, characterized in that

the method is used to examine microstructural changes in the substrate (4) and/or the at least one layer (7, 10), which are caused by a phase change in the material of the substrate (4) and/or the at least one layer (7, 10).

13. The method as claimed in claim 1 to 12, characterized in that

the thermal conductivity (λ) is determined by a laser flash method or by a thermal wave analysis.

14. The method as claimed in claim 1 to 13, characterized in that

the material parameter of the substrate (4) is determined with layer (7, 10) present on the substrate (4).

15. The method as claimed in claim 1 to 13,

characterized in that

a material parameter of the substrate (4) and the layer (7, 10) together is determined.

16. The method as claimed in claim 1, 6, 7 or 10, characterized in that

the method is carried out using a substrate (4) made from an iron-base, cobalt-base or nickel-base superalloy.

17. The method as claimed in claim 1, 6, 7, 10 or 12, characterized in that

the method is carried out using a layer system (1), the layer (7) having the composition of an MCrAlX layer, where M stands for at least one element selected from the group consisting of iron, cobalt or nickel, and X stands for yttrium, silicon and/or at least one rare earth element.

18. The method as claimed in claim 1, characterized in that

the method is carried out using a component (1) of a gas turbine (100) or steam turbine (300, 303), in particular a turbine blade or vane (120, 130, 354, 357) or a lining of a combustion chamber (110).

19. The method as claimed in claim 1, characterized in that

the measurement of the material parameters is carried out on line.

20. The method as claimed in claim 1 or 2, characterized in that

beyond a defined percentage change in the material parameter, a time is laid down beyond which the component (1) needs to be inspected, refurbished or completely replaced.

21. The method as claimed in claim 1 or 18, characterized in that

the component (1, 120, 130) is a component of an apparatus (100, 300, 303), and
in that the material parameter is measured while the component (1, 120, 130) is installed in the apparatus (100, 300, 303).